HARDWOOD PLYWOOD & VENEER ASSOCIATION
LABORATORY AND TESTING SERVICE
P.O. Box 2789, Reston, Virginia 20195-0789 U.S.A. 1825 Michael Faraday Drive, Reston, Virginia 20190-5350 TELEPHONE 703-435-2900 FAX 703-435-2537

IX. TEST RESULTS

Test results calculated on the basis of the areas under the curves of flame spread distance and smoke developed versus time are provided in the table below for calibration materials and for:

Fiberlock IAQ 7000 Duct Liner Adhesive
Coating/Encapsulant

Material Description	Flame Spread Index	Smoke Developed Index
High Density Inorganic Reinforced Cement Board	0	0
Red Oak Flooring	100	100
T-10776	15	10

OBSERVATIONS: Coating consumed to 5 feet, blistered to 8 feet.

REMARKS: * Coating applied by the HPVA Laboratory to 1/4" cement board. Coating brush applied in two coats at an application rate of 150 sq.ft. per gallon per coat.

CONCLUSIONS: Based on one test, the Flame Spread Index, calculated according to ASTM E 84, meets Class A (Class I) - 25 or under flame spread.

REPORT PREPARED BY:

KEVIN P. HAILE
FIRE TECHNOLOGIST

REPORT REVIEWED BY:

RUSSELL L. CHAPMAN
DIRECTOR, PRODUCT EVALUATION & STANDARDS

Table 2-1.1.1 Nominal Thickness of Sheet Metal Ducts

Diameter or Width		Nominal Thickness		Galvanized Sheet Minimum Thickness		Aluminum Thickness		Tin Plate Minimum Weight per Base Box	
in.	mm	in.	mm	in.	mm	in.	mm	lb	kg
Round Ducts and Enclosed Rectangular Ducts									
14 or less	356 or less	0.016	0.406	0.013	0.330	0.016	0.406	135	61
Over 14	Over 356	0.019	0.483	0.016	0.406	0.020	0.508	—	—
Exposed Rectangular Ducts									
14 or less	356 or less	0.019	0.483	0.016	0.406	0.020	0.508	—	—
Over 14	Over 356	0.022	0.559	0.019	0.483	0.023	0.584	—	—

2-2 Return Systems.

2-2.1 Duct Materials.

2-2.1.1 Return ducts shall be permitted to be constructed of metal, of 1-in. (25.4-mm) nominal wood boards, or of other suitable material, provided that no material more flammable than 1-in. (25.4-mm) boards shall be used.

Exception: As required by 2-2.1.2.

2-2.1.2 Portions of return ducts directly above the heating surface or closer than 2 ft (0.61 m) from the outer jacket or casing of the heater shall be constructed in accordance with provisions of 2-1.1 for supply ducts.

2-2.1.3 The interior of combustible ducts shall be lined with noncombustible material at points where there might be danger from incandescent particles dropped through the register or heater, such as directly under floor registers and the bottom of vertical ducts or directly under heaters having a bottom return.

2-2.2 Duct Openings. In buildings where vertical openings are required to be enclosed by walls or partitions having a fire resistance rating, openings in the enclosures for connections to vertical ducts carrying return air from more than one story shall be protected by approved fire dampers in such openings.

2-2.3 Continuous Ducts.

2-2.3.1 Return air shall be conducted to the appliance through continuous ducts.

Exception: As permitted in 2-2.3.2 and 2-2.3.3.

2-2.3.2* Underfloor spaces shall be permitted to be used as plenums for return of air from rooms directly above, provided such spaces are cleaned of all combustible material, are tightly and substantially enclosed, and are not used for storage or occupancy. Furnaces, boilers, and other heat-producing appliances shall not be installed in such a return plenum.

2-2.3.3 In a single-story residence, the return air shall be permitted to travel through the first floor living space to the return air inlet on the furnace. *(See 4-3.3.)*

2-2.4 Public Corridors. Public corridors shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas other than toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly on the corridor.

Exception: This requirement shall not prohibit the use of a corridor as follows:

(a) A source of makeup air through normal leakage around doors for interior exhaust fans in kitchens, appliances, bathrooms, and toilets

(b) A portion of a smoke control system, subject to the approval of the authority having jurisdiction

2-2.5 Negative Pressure from Circulating Fan. The return system and circulating fan shall be arranged so that negative pressure from the circulating fan cannot affect the air supply for combustion or act to draw products of combustion from joints or openings in the furnace or flue.

2-3 Common Requirements.

2-3.1* Duct Coverings and Linings.

2-3.1.1 Duct coverings *(see definition in Section 1-3)*, duct linings *(see definition in Section 1-3)*, and tapes used in duct systems shall have a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state.

Exception: These requirements shall not apply to duct coverings where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.

2-3.1.2 Duct coverings and linings shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C 411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, at the temperature to which it is exposed in service. In no case shall the test temperature be below 250°F (121°C).

2-3.1.3 Appliances such as fan coil units, self-contained air-conditioning units, and furnaces shall be considered to meet the requirements of 2-3.1.1 if they are listed. Unlisted solar energy air distribution system components shall be accompanied by supportive information indicating that their flame spread and smoke developed characteristics are not in excess of those of the duct system to which they are connected.

2-3.2.1.4 Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

2-3.2.1.5 Air connectors shall not pass through floors.

2-3.2.2 Vibration isolation connectors in duct systems shall be made of an approved flame-retardant fabric or shall consist of sleeve joints with packing of approved material, each having a maximum flame spread index of 25 and a maximum smoke developed index of 50.

Exception: Approved flame-retardant fabric having a maximum length of 10 in. (25.4 cm) in the direction of airflow.

2-3.3 Supplementary Materials for Air Distribution Systems.

2-3.3.1 Pipe insulation and coverings, duct coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50. Where these products are to be applied with adhesives, they shall be tested with such adhesives applied, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state. *(See 2-2.4.2.)*

Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, shall have been tested and listed in accordance with UL 181A, *Standard for Safety Closure Systems for Use with Rigid Air Ducts and Air Connectors*, or UL 181B, *Standard for Safety Closure Systems for Use with Flexible Air Ducts and Air Connectors*, and used in accordance with the conditions of their listings.

Exception No. 1: This requirement shall not apply to air duct weatherproof coverings where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.

Exception No. 2: Smoke detectors required by 4-4.2.

2-3.3.2 Air duct, panel, and plenum coverings and linings, and pipe insulation and coverings shall not flame, glow, smolder, or smoke when tested in accordance with a similar test for pipe covering, ASTM C 411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, at the temperature to which they are exposed in service. In no case shall the test temperature be below 250°F (121°C).

2-3.3.3 Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating.

Exception: Where such coverings meet the requirements of 3-4.6.4.

2-3.3.4* Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

2-3.3.5 Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

2-3.4 Air Duct Access and Inspection.

2-3.4.1* A service opening shall be provided in air ducts adjacent to each fire damper, smoke damper, and smoke detector. The opening shall be large enough to permit maintenance and resetting of the device.

2-3.4.2 Service openings shall be identified with letters having a minimum height of $^1/_2$ in. (1.27 cm) to indicate the location of the fire protection device(s) within.

2-3.4.3 Horizontal air ducts and plenums shall be provided with service openings to facilitate the removal of accumulations of dust and combustible materials. Service openings shall be located at approximately 20-ft (6.1-m) intervals along the air duct and at the base of each vertical riser.

Exception No. 1: Removable air outlet or air inlet devices of adequate size shall be permitted in lieu of service openings.

Exception No. 2: Service openings shall not be required in supply ducts where the supply air has previously passed through an air filter, an air cleaner, or a water spray.

Exception No. 3: Service openings shall not be required where all the following conditions exist:

(a) The occupancy has no process that produces combustible material such as dust, lint, or greasy vapors. Such occupancies include banks, office buildings, churches, hotels, and health care facilities (but not kitchens, laundries, and manufacturing portions of such facilities).

(b) The air inlets are at least 7 ft (2.13 m) above the floor or are protected by corrosion-resistant metal screens of at least 14 mesh (0.07 in.) that are installed at the inlets so that they cannot draw papers, refuse, or other combustible solids into the return air duct.

(c) The minimum design velocity in the return duct for the particular occupancy is 1000 ft/min (5.08 m/sec).

2-3.4.4 Inspection windows shall be permitted in air ducts provided they are glazed with wired glass. However, service openings shall be provided as required in 2-3.4.1.

2-3.4.5 Openings in walls or ceilings shall be provided so that service openings in air ducts are accessible for maintenance and inspection needs.

2-3.4.6 Where a service opening is necessary in an air duct located above the ceiling of a floor- or roof-ceiling assembly that has been tested and assigned a fire resistance rating in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, access shall be provided in the ceiling and shall be designed and installed so that it does not reduce the fire resistance rating of the assembly.

2-3.5 Air Duct Integrity.

2-3.5.1 Air ducts shall be located where they are not subject to damage or rupture, or they shall be protected to maintain their integrity.

2-3.5.2 Where an air duct is located outdoors, the air duct, together with its covering or lining, shall be protected from harmful elements.

2-3.5.3 Where electrical, fossil fuel, or solar energy collection heat sources are installed in air ducts, the installation shall avoid the creation of a fire hazard. Air ducts rated as Class 1 in accordance with UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, air duct coverings and linings shall be interrupted at the immediate area of operation of such heat sources in order to meet the clearances specified as a condition of the equipment listing.

Exception No. 1: Appliances listed for zero clearance from combustibles where installed in accordance with the conditions of their listings.

Exception No. 2: Insulation specifically suited for the maximum temperature that reasonably can be anticipated on the duct surface shall be permitted to be installed at the immediate area of operation of such appliances.